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(54) **Recording and retrieval of information relevant to the activities of a user**

Aufnahme und Wiederauffindung von für Aktivitäten des Benutzers relevanter Information

Enregistrement et recouvrement d'informations en rapport aux activités d'un utilisateur

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(73) Proprietor: **Xerox Corporation**
Rochester, New York 14644 (US)

(72) Inventors:
- **Lamming, Michael, G.**
  Cambridge, CB2 1RN (GB)
- **Flynn, Michael**
  Cambridge, CB1 1DG (GB)

(74) Representative: **Grünecker, Kinkeldey,**
Stockmair & Schwanhäusser Anwaltssozietät
Maximilianstrasse 58
80538 München (DE)

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Description

[0001] This invention relates to a system and method for the recording and retrieval of information relevant to the activities of the user. The invention is particularly suitable for implementation in the form of a memory aid device which is portable, and preferably wearable by the user.

[0002] Memory problems are widespread but little has been done to exploit information technology to help. People have many procedures designed to compensate for their fallible memory, for example, writing lists, organising things in files, putting notices on notice boards and setting alarms. Even in a well-organised setting, things might be mislaid or forgotten because they were not seen to be important at the time they were encountered. These failures of memory have a cost, both in the time spent recovering (such as looking for mislaid documents) and in the time spent organising things in the first place so that problems do not arise.

[0003] One current form of memory aid is the electronic personal organiser, which is similar in form to a hand-held calculator. Although such a device is capable of holding large amounts of information, each item must be entered, usually manually, so the user must both input the information and remember to do so.

[0004] Various other systems have recently been proposed to help the user recall past events as well as to provide reminders of future intentions. For example, in EP-A-0,495,622 there is described an activity-based information retrieval system which automatically captures and records certain aspects of the context in which a recorded event took place. The system relies on a variety of apparatuses for monitoring, recording and time-stamping various key aspects of human activity, from which a readable list of episodes, or 'activity diary' can be generated automatically. In one example, the system uses encoded identifiers, each intended to be carried by people working in the environment being monitored. One particularly convenient form of identifier is the "active badge" offered by Olivetti. This identifier takes the form of miniaturised circuitry in a housing able to be pinned or clipped to the clothing of the person to whom the identifier is issued. The circuitry is designed to emit pulse width modulated infra-red coded signals for a tenth of a second every 12 to 15 seconds. The signals, by their nature, have a range of about six metres, and will not travel through walls, which makes them very useful for keeping track of people moving between rooms in a normal working environment. In each of the rooms or corridors of interest would be positioned one or more sensors responsive to the infra-red signals. The sensors would be connected to a master station processor, which would have the task of polling the sensors for identification 'sightings'; processing the data (which would include decoding the signals to determine which person was within range of a specified sensor at the time of polling), and presenting the processed data in a visual format in the form of a diary. This diary, which correlates quite closely with human recollections of past episodes, can be used simply to stimulate further recall, or to identify an episode and its time of occurrence, or to show a set of episodes from different sets. The time may be used to locate the corresponding items in any other set of time-stamped data, such as a sequence of video frames or an audio record of a meeting.

[0005] A related system was disclosed in an article in The Sunday Times, 11 February 1990, entitled "Computers acquire social skills", by Jane Bird. This mentioned the use of identity buttons to enable the computer to know who was where in the building at all times. Associated with the system is a network of microphones and/or video cameras capable of recording conversations. It gave the example of a copier in a room monitored by the computer Upon the copier's developing a fault, a frustrated would-be user tries to recall what a colleague told him about how to cure the fault. The computer is interrogated to find the last time that the two people concerned were at the copier. Once this particular bit of information has been recovered, it is used to access the time-stamped audio records of what was said in the room containing the copier at that point of time. In this way, the enquirer has the opportunity of hearing again the conversation between him and his colleague.

[0006] From the Proceedings of the Usenix Conference of 1991 in Nashville, USA, an activity server is known which combines high-level information received from various sources and processes them in a central processing apparatus.

[0007] The aforementioned systems have several practical limitations. These include the need on the part of the user to devote a lot of effort to identifying a particular time and place from the raw data, and the lack of precise episode definition from such data. Also the systems capture just the location of users, and not their activity or other significant episodes. These drawbacks would make the systems of relatively little practical value.

[0008] There is still, therefore, a need for an improved memory aid system which requires minimum input from a user, and yet which is easier to use for retrieving information than to remember or find whatever it is that has been forgotten or mislaid. It is an object of the present invention to meet this need.

[0009] This object is solved by the system according to claim 1 and by the method according to claim 15.

[0010] The invention may be employed to provide a memory prosthesis in the form of a highly portable device (e.g. a device worn like a watch) which records all kinds of information about the user's life, and provides a simple and rapid means of access to that information. The device receives and stores information from external sources ('objects') via, for example, a cellular communications network, or from signal generators identifying specific machines, places, or people carrying other ones of the same type of device The data can either be stored in the memory of the device itself, or, for better protection against failure, in a central data repository of the system, with a fail-safe backup.

[0011] Data is gathered continuously with no attempt being made to categorise or filter it at the time of collection. This means that all the data is retained, so that items that might have been categorised as insignificant at the time of collection can later be retrieved. As a result there will be large quantities of data for the user to search. For the memory prosthesis to be usable, it must provide a mechanism for enabling the user to constrain the search and rapidly find the relevant information. This mechanism is supported by the data model described below.

[0012] The data consists of series of events which happen to each object in the system. Each object, also referred to as a device, has its own "thread", a linear organisation in time of the events occurring as the object encounters other objects. Access to the data is achieved by displaying sequentially, running either forwards or backwards in time, the series of events along a selected thread. Rapid searching is made possible by specifying events formed by the coincidence of several threads, or by changing from one thread to another at a event where the two threads intersect.

[0013] The memory prosthesis records all kinds of information about the user's life, and by providing a simple and rapid means of access to this information it can help the user to recall things that might otherwise be forgotten. All information in certain specified categories is gathered, without filtering, so that even things that might not have appeared important at the time of recording can later be recovered.

[0014] A system and method in accordance with the invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 is a diagrammatic representation of the elements which comprise an 'object', as defined herein;
Fig. 2 is a pictorial representation of an example of a system in accordance with the invention;
Fig. 3 is a diagrammatic representation of the threads of several objects,
Fig. 4 illustrates a set of 'threads' to show how a user can navigate the information in a database;
Fig. 5 shows an example of a user interface; and
Fig. 6 is a flow chart showing how data is processed by one of the 'objects' used in the system of the invention.

[0015] Referring to Fig. 1, the basis of the information recording system comprises at least two 'objects' 10 of the kind shown, which together define a domain. The domain may cover, for example, a room, a building, all the buildings within a group of buildings, or a larger area. An object 10 represents a person or another identifiable entity such as a location, an apparatus or machine, a vehicle, a piece of mail, some text, a number, a time. The system thus comprises a set of objects 10, within the domain, for which a history can be generated automatically. Each object 10 conforms to the architecture shown in Figure 1. All objects 10 have a *database* 12 in which they store descriptions of the activities in which they were involved. A whiteboard might store the names of people using it, derived for example from active badge identifiers, and snapshots of its contents at periodic intervals. Associated with each object is an *agent*, also referred to as a control unit, 14 which has three main functions; it manages the database 12; it exchanges information with other objects over a communications channel 16; it communicates with human users over a user *interface* 18 (UI) to answer queries using the database; finally, it collects data from its own sensors 20. While a system has at least one device with an agent 14, a database 12, and a means 16 to communicate with other objects, there may be devices which do not have a UI if they do not provide an interface for querying their database. A room-conversation detection object is an example. Some objects 10 may not contain sensors if they obtain all their information from remote sources over the communications channel.

[0016] Referring now to Figure 2, there is shown a system containing a number of objects which form a domain including a personal, portable, computer 30 which may be described as a 'tab'. This tab includes an agent, a database, a UI which includes a screen 32 and control buttons 34, and communication means which are preferably wireless, such as radio or infra-red. Jane, the person whom the tab represents, carries or wears the tab as she moves around the domain and carries out various tasks. The tab here is the object which represents Jane. When she encounters (e.g. approaches, enters, or uses) one of the other objects, a signal between Jane's tab and the other object generates a time-stamped record in the database of Jane's tab (and possibly also in the database of the other object). The record includes the time of the encounter (the time-stamp), and identifies the primary object (Jane), an attribute of that object (e.g. location - 'at'), and a value of that attribute (Jane's Office).

By way of example, let us assume that Jane enters her office one day at 10:15. Here, the record in her database will show "10:15 (time-stamp) - Jane (object) - at (attribute) - Jane's Office (value of attribute)" The screen on her tab can use either words or icons to display this record, or a mixture of the two. If Steve enters Jane's office at 10:47, a record is generated to show that Steve and Jane are collocated in Jane's office. When Jane uses the telephone at 10:53 to call Bob, the object representing her has the attribute 'using' and the value 'telephone'. The record will show Jane, Steve, and telephone being used by Jane (to call Bob), in Jane's office. Jane makes a note during the telephone call. This note may also be recorded in Jane's database, either automatically if she made it, say, on a workstation which is another of the objects in the system, or manually using her tab. Jane then finishes the telephone call, and Steve leaves her office.

[0017] If, many months later, and using the example just described, Jane wishes to recall the note she made during

her telephone conversation, she can ask her tab to show her a list of all her telephone calls. This might be unmanageably long, so she might remember that she made the note while on the telephone at a time when Steve was in her office. Thus she could ask her tab to list for her all those occasions when she was using the telephone while Steve was in her office. This would considerably limit the search (assuming Steve was an infrequent visitor), and the tab screen would show just those (few) occasions which would include the one that Jane was seeking. She could then identify the note, for example by its time-stamp, and display it on her tab.

[0018] The objects shown in Figure 2 have different configurations and requirements. It is most likely that all the human users will need a database and a UI, but much less likely that the other objects, like offices or machines, will need them. However, it is sometimes useful for machines to have both, so that records of who used which machine at what time can be kept and later reviewed.

[0019] The following definitions and explanations are provided to assist in understanding the invention.

DATA MODEL

[0020] *Information* is held in the database as a sequence of time-stamped facts.

[0021] Each *fact* consists of an object, an attribute and a value.

[0022] A *fact* represents the knowledge that the attribute of the object is the value.

[0023] The *time-stamp* indicates the time at which this fact became known.

[0024] The *sequence* is held in chronological order in a relational database.

[0025] An *object* represents either a person or any other entity which is identifiable by the system, such as a location, an apparatus or machine, a vehicle, a piece of mail, some text, a number, or a time.

[0026] An *attribute* indicates one of the possible properties that some object may possess, such as hair colour, whereabouts, or size.

[0027] A *value* represents the particular value of an attribute, such as black for hair colour, the kitchen for whereabouts, or large for size (See Table 1 below).

Table 1,

Typical time-stamped facts in a database.

Time	Object	Attribute	Value
11:05:26 Mon 21st June 1993	Steve	at	Kitchen
11:37:13 Mon 21st June 1993	Jane	at	Jane's Office
11:39:22 Mon 21st June 1993	Jane	at	Kitchen
11:42:35 Mon 21st June 1993	Jane	at	Jane's Office
12:01:04 Mon 21st June 1993	Jane	availability	Busy
12:01:09 Mon 21st June 1993	Kitchen	temperature	22 Celcius

[0028] The episode which Table 1 represents can be described as follows. Steve enters the kitchen at 11:05. Jane enters her office at 11:37, and then goes into the kitchen at 11:39. She returns to her office at 11:42, and is recorded as being 'busy' (e.g. with a telephone call) at 12:01 Since no change has been noted in Steve's 'at' attribute, it can be assumed that he remained in the kitchen throughout this period of time. It is possible to infer from this that while Jane was in the kitchen, Steve and Jane were collocated at 11:39. This inferred fact is shown in Table 2.

INFERENCE

[0029] An agent may apply *inference rules* to the information thus held, in order to establish other facts not directly recorded, such as when two people were in the same room, or the duration of a meeting.

[0030] Such *inferred facts* may be determined by the agent upon request, or determined in advance and held in the database on the same footing as ordinary facts.

[0031] Inferred facts may be used during inference, to produce further inferred facts. (See Table 2 below).

Table 2.

An extra inferred fact introduced, in italics			
Time	Object	Attribute	Value
11:05:26 Mon 21st June 1993	Steve	at	Kitchen
11:37:13 Mon 21st June 1993	Jane	at	Jane's Office
11:39:22 Mon 21st June 1993	Jane	at	Kitchen
11:39:22 Mon 21st June 1993	*Steve*	*co-located*	*Jane*
11:42:35 Mon 21st June 1993	Jane	at	Jane's Office
12:01:04 Mon 21st June 1993	Jane	availability	Busy
12:01:09 Mon 21st June 1993	Kitchen	temperature	22 Celcius

PATTERNS

[0032] When a request for information is made to the agent, a pattern may be specified.

[0033] A *pattern* consists of either: a conjunction of patterns; a disjunction of patterns; a negation of a pattern; or an object.

[0034] Such a pattern filters the information yielded by the agent to include only those facts which conform to the pattern.

[0035] A fact conforms to a *conjunction* of patterns if it conforms to each of the conjoined patterns individually.

[0036] A fact conforms to a *disjunction* of patterns if it conforms to any one or more of the disjoined patterns.

[0037] A fact conforms to a *negated* pattern if it does not conform to the pattern which is negated.

[0038] A fact conforms to an object pattern, if the fact mentions the object of the pattern.

SEARCH

[0039] In response to information request, the agent *searches* for particular facts by considering the whole of the sequence of facts and making those inferences possible, to find facts conforming to the supplied pattern.

[0040] In principle, the agent checks every fact, simple or inferred, for conformity with the pattern.

[0041] In practice, the agent need only consider those facts pertinent to the pattern - that is, the contents of the pattern may be used to inform and constrain the possibly huge search undertaken by the agent to reasonable dimensions.

[0042] For example, a pattern which specified that a particular person, place and day of the week must be mentioned, allows the agent to consider only those facts and inferred facts pertinent to that person, place and day, thus greatly reducing the scope of the required database search and the number of facts which must be tested for conformity to the pattern.

THREADS

[0043] If a pattern contains at least one object, then the only facts that the agent will yield are those pertinent to that object. Such a chronological sequence of facts may be considered a biography of the specified object, or *thread*.

[0044] A simple user-interface paradigm would be to keep at least one object in the pattern at all times, and display a thread for that object. Such a thread will mention other objects, such as locations or other people. One of these other objects may be selected by the user as the new focus, and the pattern used from then on would contain the new object. Thus a switch in perspective occurs, to the thread of the newly selected object - the biography displayed is now that of the new object.

[0045] The world is thus seen as consisting of a variety of objects, each one of which automatically generates an autobiography recording events in its "life". These objects could in principle be anything, but typical examples are people (at least, computers attached to them), offices, telephones, notebooks and workstations (see Figure 2). The autobiography for each object consists of a series of events that happened to that object, each event being an encounter of this object with another. These events are organised linearly in time as a "thread". For example, as Steve walks around his thread 40 shows him in his office 42, then the stairwell 44, and then the common room 46 (see Figure 3). Conversely, his office thread 42 shows him 40 enter, stay for a while and then leave. The stairwell thread 44 shows him 40 enter and leave and finally the common room thread 46 shows him arrive. A further thread 48 belonging to

Jane shows her visiting Steve 40 whilst he is in his office 42. This visit also appears on Steve's own thread 40 and that of his office 42. During this period Steve interacts several times with his electronic notebook 50. Each interaction appears on the thread of the notebook 50 and also on Steve's thread 40 and the thread for the room in which he is using the notebook. Whilst he is in the common room 46, Steve uses the copier 52. This interaction also appears on his thread 40, and those of the common room 46 and copier 52.

[0046] Threads that run together indicate *collocation* of the objects that own the threads. The collocation could also be taken to mean some other sort of relationship such as "interacted with" (e.g. via telephone or workstation), thus representing a logical collocation rather than a physical one. The significant points recorded on a thread are the points where threads join together or split apart, indicating a transition from one state of affairs to another.

[0047] Users can retrieve information about events in their life by finding the relevant points in the threads structure. Starting from any point they can navigate around this structure by moving forward or back between events along a particular thread. For example, if Steve had mislaid some papers given to him by Jane during her visit to his office he could prompt his memory by looking on his thread and finding Jane's departure from his office. From here he could move along the thread to see the subsequent events: him leaving his office, entering and leaving the stairwell and entering the common room. He then sees that the next event on his thread records him using the copier and this reminds him that he left the papers on the table beside the copier.

[0048] The user can also switch onto another thread at a point where the current thread intersects it. For example, if Steve found someone's originals in the copier when he came to use it he could switch from his thread to that of the copier. By following back down the copier thread he could find the previous person who used the copier and hence return the originals.

[0049] These examples have been very simple, but in reality there will be a large number of events in any thread that is to be navigated. To simplify navigation the user can specify which particular events are of interest by giving a pattern to be matched. Such patterns can specify any combination of location, people, time or other objects. For example, if Steve specifies "in my office with my notebook with Jane" he will see only those occasions that match this pattern i.e. those occasions when he was in his office with Jane and made some notes.The actual notes, which may have been recorded in the database by the user, are linked to these events, thus allowing him to retrieve them.

[0050] By way of example of a user 'navigating' the database using the threads model, reference is made to Figure 4 in conjunction with Table 3. Figure 4 shows a sequence of seven events, labelled in chronological order of their occurrence from 1 to 7. Each event comprises the conjunction (intersection) of two or more of threads A, B, and C. Event 1 shows a coincidence of threads A, B and C, event 2 involves only threads A and B, event 3 involves threads A and C, and so on. In searching the part of the database involving these events, the user might 'browse' in the manner represented by way of example in Table 3. In the first step, he starts at event 1, moves forward (in time) along thread A and arrives at event 2. In step 2 he moves backwards along thread A and returns to event 1. In step 3 he changes to thread B. In step 4 he moves forward along thread B to arrive, on thread B, at event 2. In step 5 he moves forward along thread B to arrive at event 4. In step 6 he changes to thread C. In step 7 he moves forward along thread C to arrive at event 6.

[0051] Instead of navigating along single threads, as just described, the user may select patterns of threads, the simplest pattern being a conjunction of two or more threads. I step 10, search is requested by the conjunction of threads A, B and C. Starting at event 1, which is the first such conjunction, the user moves forward to event 7, which is the next such conjunction. In step 11, a change is made to a pattern consisting of the conjunction of threads A and B. In step 12, the user moves backwards through such patterns, the next occurrence of an A,B conjunction (going backwards) being event 5.

Table 3,

Example of navigating data in a threads model				
Step No.	Event	Search Direction	Thread	Result
1	1	Forward	A	2 (on A)
2	2	Backward	A	1 (on A)
3	1	Change to B	A	1 (on B)
4	1	Forward	B	2 (on B)
5	2	Forward	B	4 (on B)
6	4	Change to C	B	4 (on C)
7	4	Forward	C	6 (on C)

Table 3, (continued)

Example of navigating data in a threads model				
Step No.	Event	Search Direction	Thread	Result
. .	. .	. .	. .	. .
10	1	Forward	A, B, C	7 (on A, B, C)
11	7	Change to A,B	A, B, C	7 (on A, B)
12	7	Backward	A, B	5 (on A,B)

USER INTERFACE

[0052] Figure 5 gives one simple example of how the user interface might be organised for the memory prosthesis. The physical buttons on the side of the device can be used for moving forward or back through the current thread. Touching one of the on-screen buttons associated with intersecting threads switches to that thread.

[0053] The device shown in Figure 5, in the form of a 'tab', can be large enough for words to be used on its screen. However, if a smaller device, such as one in the same form as a watch, will need to have its information displayed in a highly codified fashion. I this case, each episode or event listed occupies a single line containing a sequence of icons. The first item in each line represents the start time of the episode. It is followed by an activity indicator, representing the type of activity, such as a meeting, a time spent doing paperwork, or perhaps a vacation. The rest of the line contains a sequence of icons, each of which represents an object which the user encountered in the displayed episode. The top line of such a display contains information which applies to the whole of the history. It includes an icon representing the owner of the history displayed. It also includes the icons representing the filter pattern. The rest of the line contains the list of items that are common to all the episodes listed below it. This avoids repeating icons in each episode description, thereby economising on screen space.

[0054] In reality any such user interface would be generally used as part of some other application, in a similar way to the Finder dialogues on the Macintosh. It would provide a standardised way for the user to locate information using biographical information. The particular application would dictate what happened to the information retrieved.

[0055] Referring now to Figure 6, there is shown a flow diagram illustrating the interactions of the main constituents of one of the objects which form part of the system of the invention.

Claims

1. An information recording system consisting of at least two devices, at least one of said devices (10) being allocated to a human user and part thereof being portable by said human user and each device comprising means for wireless communication (16) with the other device, a control unit (14) and a database (12), wherein each control unit controls transmission of information via the means for wireless communication (16) concerning the identification of the respective device (10) and further controls the reception of the respective identifying information from other devices, **characterized in that** each control unit (14) automatically records in its respective database (12) identifying information received from another device upon the occurrence of a physical or logical collocation with the respective other device (10) to obtain a sequence of chronological occurrences in said database (12).

2. The system of claim 1 where each of said identifying information is described by a fact which comprises an attribute and the value of that attribute for a given device (10) at the time communicated by the time stamp and is recorded as such.

3. The system according to any one of claims 1 or 2, where at least one device has a user interface (18) providing means for entering and retrieving information from said database (12).

4. The system according to any one of claims 1 to 3 where a sensor (20) provides data about its surroundings.

5. The system of claim 1 including means to enable manual entry of facts or other information into at least one database (12) of one device (10).

6. The system according to any one of claims 1 to 5 further including means for automatically recording facts in the database (12) at predetermined times.

7. The system according to any one of claims 1 to 6, further including means for automatically recording facts in the database (12) on the occurrence of predetermined values of a attribute.

8. The system according to any one of claims 1 to 7, where the user interface (18) enables the user to retrieve from the database (12) a sequence of occurrences of a selected fact or pattern of facts.

9. The system according to any of claims 1 to 8, wherein the user interface (18) enables the user to search by displaying sequentially the occurrences of a selected fact or pattern of facts.

10. The system according to any one of claims 8 or 9, wherein each sequence of occurrences of a fact comprises a "thread" when each of the facts is represented by the coincidence of two or more of the threads, and wherein the user can search the database (12) by selecting one thread, or by selecting the coincidence of a plurality of threads, or by moving from one thread to another.

11. The system according to any one of claims 1 to 10, wherein at least part of one of the devices is wearable by a user.

12. The system according to any of the previous claims, where at least one device (10) without a sensor (20) and without an user interface (18) is arranged to transmit signals to cooperate with devices (10) having both a sensor (20) and a user interface (18).

13. The system according to any of the previous claims, wherein the communication means (16) of some of the devices (10) comprise a cellular communications network, enabling a device (10) to determine its position in the network.

14. The system according to any one of the previous claims, wherein at least one device (10) is in communication with a central data processing unit.

15. A method for use in an information recording system consisting of at least two devices, at least one of said devices (10) being allocated to a human user and part thereof being portable by said human user and each device comprising means for wireless communication (16) with the other device (10), a control unit (14) and a database (12), the control unit (14) controls transmission of information via the means for wireless communication (16) concerning the identification of the respective device (10) and further controls the reception of the respective identifying information from other devices said method comprising the steps of:

    recognizing the presence of another device (10) in physical or logical collocation with the device;
    receiving the identification information from the other device (10) over a communications channel (16); and
    automatically storing the information in the databases (12);

16. The method according to claim 15, said method further comprising the steps of:

    organizing data obtained from received identifying information as a set of threads, each thread comprising a chronological sequence of time stamped facts all of which relate to a single device (10) and at least some of which also represent descriptors of other devices (10), each device (10) representing a person or an identifiable entity, and each of the facts comprising a attribute and a value of that attribute for a given device (10);
    displaying the sequence of facts of a selected thread, or the sequence of events defined by the coincidence of two or more threads;
    moving selectively forward or backward in time through the displayed sequence of facts or events; and
    enabling the selection, for subsequent display, of any of the threads of a displayed event.

Patentansprüche

1. Informationsaufzeichnungssystem, das aus mindestens zwei Geräten besteht, von denen mindestens ein Gerät (10) einem Menschen als Benutzer zugeordnet ist und ein Teil davon für den benutzenden Menschen tragbar ist, und wobei jedes Gerät Mittel (16) zur drahtlosen Verbindung mit dem anderen Gerät, eine Steuereinheit (14) und eine Datenbasis (12) umfasst, von denen jede Steuereinheit die Übertragung von Information über das Mittel (16)

zur drahtlosen Verbindung mit Bezug auf die Identifizierung des jeweiligen Gerätes (10) steuert und weiter den Empfang der jeweiligen Identifikations-Information von anderen Geräten steuert,
dadurch gekennzeichnet, dass jede Steuereinheit (14) automatisch in ihrer jeweiligen Datenbasis (12) Identifizierungsinformation aufzeichnet, die vom anderen Gerät beim Auftreten einer körperlichen oder logischen Zuordnung mit den jeweiligen anderen Geräten (10) empfangen wurde, um eine Folge von chronologischen Vorkommnissen in der Datenbasis (12) zu erhalten.

2. System nach Anspruch 1, bei dem jeder Teil der identifizierenden Information durch die Tatsache beschrieben wird, welche ein Attribut und den Wert dieses Attributes bei einem bestimmten Gerät (10) zu dem Zeitpunkt umfasst, der durch die Zeitmarkierung verbunden ist und so aufgezeichnet wird.

3. System nach einem der Ansprüche 1 oder 2, bei dem mindestens ein Gerät eine Benutzerschnittstelle (18) aufweist, die ein Mittel zum Eingeben und Abziehen von Information in die bzw. von der Datenbasis (12) schafft.

4. System nach einem der Ansprüche 1 bis 3, bei dem ein Sensor (20) Daten über seine Umgebung ergibt.

5. System nach Anspruch 1, das Mittel enthält, um Handeinträge von Fakten oder anderer Information in mindestens eine Datenbasis (12) eines Gerätes (10) zu ermöglichen.

6. System nach einem der Ansprüche 1 bis 5, das weiter Mittel zum automatischen Aufzeichnen von Fakten in der Datenbasis (12) zu vorgegebenen Zeitpunkten enthält.

7. System nach einem der Ansprüche 1 bis 6, das weiter Mittel zum automatischen Aufzeichnen von Fakten in der Datenbasis (12) beim Auftreten vorgegebener Werte eines Attributes enthält.

8. System nach einem der Ansprüche 1 bis 7, bei dem die Benutzerschnittstelle (18) dem Benutzer das Abziehen einer Folge von Vorkommnissen eines ausgewählten Fakts oder eines Musters von Fakten von der Datenbasis (12) ermöglicht.

9. System nach einem der Ansprüche 1 bis 8, bei dem die Benutzerschnittstelle (18) es dem Benutzer ermöglicht, durch aufeinanderfolgendes Anzeigen des Auftretens eines gewähltes Fakts oder Musters von Fakten eine Suche durchzuführen.

10. System nach einem der Ansprüche 8 oder 9, bei dem jede Folge von Vorkommnissen eines Fakts einen "Ablauf" umfasst, wenn jeder der Fakten durch das Zusammentreffen von zwei oder mehreren der Abläufe repräsentiert wird, und wobei der Benutzer die Datenbasis (12) durch Wählen eines Ablaufs oder durch Wählen des Zusammentreffens einer Vielzahl von Abläufen oder durch Bewegen von einem Ablauf zu einem anderen durchsuchen kann.

11. System nach einem der Ansprüche 1 bis 10, bei dem mindestens ein Teil eines der Geräte durch einen Benutzer trag- oder mitführbar ist.

12. System nach einem der vorangehenden Ansprüche, bei dem mindestens ein Gerät (10) ohne einen Sensor (20) und ohne eine Benutzerschnittstelle (18) ausgelegt ist, Signale zum Zusammenwirken mit Geräten (10) zu senden, die sowohl einen Sensor (20) als auch eine Benutzerschnittstelle (18) besitzen.

13. System nach einem der vorangehenden Ansprüche, bei dem die Nachrichtenverbindungsmittel (16) einiger der Geräte (10) ein zellulares Nachrichtenverbindungsnetz umfassen, die es einem Gerät (10) ermöglichen, seine Position in dem Netz zu bestimmen.

14. System nach einem der vorangehenden Ansprüche, bei dem mindestens ein Gerät (10) in Nachrichtenverbindung mit einer zentralen Datenverarbeitungseinheit ist.

15. Verfahren zur Anwendung eines Informationsaufzeichnungssystems, das aus mindestens zwei Geräten besteht, von denen mindestens ein Gerät (10) einem Menschen als Benutzer zugeordnet ist und ein Teil davon durch den Menschen als Benutzer trag- oder mitführbar ist, und jedes Gerät Mittel (16) zur drahtlosen Nachrichtenverbindung mit dem anderen Gerät (10), eine Steuereinheit (14) und eine Datenbasis (12) umfasst, wobei die Steuereinheit (14) das Senden von Information über das Mittel(16) für drahtlose Nachrichtenverbindung mit Bezug auf die Iden-

tifizierung des jeweiligen Gerätes (10) steuert und weiter den Empfang der jeweiligen Identifizierungs-Information von anderen Geräten steuert, wobei das Verfahren die Schritte umfasst:

Erkennen der Anwesenheit eines anderen Gerätes (10) in körperlicher oder logischer Zuordnung zu dem Gerät;
Empfangen der Identifizierungs-Information von dem anderen Gerät (10) über einen Nachrichtenverbindungskanal (16); und
automatisches Steuern der Information in den Datenbasen (12).

16. Verfahren nach Anspruch 15, welches weiter die Schritte umfasst:

Organisieren von Daten, die von der empfangenen Identifizierungsinformation abgeleitet sind, als einen Satz von Abläufen, von denen jeder Ablauf eine chronologische Folge der zeitmarkierten Fakten umfasst, die alle zu einem einzelnen Gerät (10) Bezug haben und von denen mindestens einige auch Beschreiber anderer Geräte (10) sind, wobei jedes Gerät (10) eine Person oder eine identifizierbare Einheit repräsentiert, und jeder der Fakten ein Attribut und einen Wert dieses Attributes für ein bestimmtes Gerät (10) umfasst; Anzeigen der Folge von Fakten eines gewählten Ablaufes, oder der Folge von Ereignissen, die durch das Zusammentreffen von zwei oder mehr Abläufen definiert sind;
selektives Bewegen im Zeitablauf vorwärts oder rückwärts durch die angezeigte Folgo von Fakten oder Ereignissen; und
Ermöglichen der Auswahl, für darauffolgende Anzeige, von jedem der Abläufe eines angezeigten Ereignisses.

Revendications

1. Système d'enregistrement d'informations composé d'au moins deux dispositifs, au moins l'un desdits dispositifs (10) étant alloué à un utilisateur humain et une partie de celui-ci étant portable par ledit utilisateur humain et chaque dispositif comprenant un moyen de communications sans fil (16) avec l'autre dispositif, une unité de commande (14) et une base de données (12), dans lequel chaque unité de commande commande l'émission des informations par l'intermédiaire du moyen de communications sans fil (16) concernant l'identification du dispositif respectif (10) et commande en outre la réception des informations d'identification respectives provenant d'autres dispositifs, **caractérisé en ce que** chaque unité de commande (14) enregistre automatiquement dans sa base de données respective (12) les informations d'identification reçues depuis un autre dispositif lors de l'occurrence d'une collocation physique ou logique avec l'autre dispositif respectif (10) pour obtenir une séquence d'occurrences chronologiques dans ladite base de données (12).

2. Système de la revendication 1 où chacune desdites informations d'identification est décrite par un fait qui comprend un attribut et la valeur de cet attribut pour un dispositif donné (10) à l'instant communiqué par l'horodatage et est enregistré comme tel.

3. Système selon l'une quelconque des revendications 1 ou 2, où au moins un dispositif comporte une interface d'utilisateur (18) constituant un moyen destiné à entrer des informations dans ladite base de données (12) et à récupérer des informations à partir de celles-ci.

4. Système selon l'une quelconque des revendications 1 à 3, où un capteur (20) produit des données concernant son environnement.

5. Système selon la revendication 1, comprenant un moyen pour permettre la saisie manuelle de faits ou d'autres informations dans au moins une base de données (12) d'un dispositif (10).

6. Système selon l'une quelconque des revendications 1 à 5, comprenant en outre un moyen destiné à enregistrer automatiquement des faits dans la base de données (12) à des instants prédéterminés.

7. Système selon l'une quelconque des revendications 1 à 6, comprenant en outre un moyen destiné à enregistrer automatiquement des faits dans la base de données (12) lors de l'occurrence de valeurs prédéterminées d'un attribut.

8. Système selon l'une quelconque des revendications 1 à 7, où l'interface d'utilisateur (18) permet à l'utilisateur de

récupérer depuis la base de données (12) une séquence d'occurrences d'un fait ou d'un modèle de faits sélectionné.

9. Système selon l'une quelconque des revendications 1 à 8, dans lequel l'interface d'utilisateur (18) permet à l'utilisateur de chercher par affichage séquentiel les occurrences d'un fait ou d'un modèle de faits sélectionné.

10. Système selon l'une quelconque des revendications 8 ou 9, dans lequel chaque séquence d'occurrences d'un fait comprend un "cheminement" lorsque chacun des faits est représenté par la coïncidence de deux ou plusieurs des cheminements, et dans lequel l'utilisateur peut chercher dans la base de données (12) en sélectionnant un cheminement, ou en sélectionnant la coïncidence d'une pluralité de cheminements, ou en se déplaçant d'un cheminement à un autre.

11. Système selon l'une quelconque des revendications 1 à 10, dans lequel au moins une partie de l'un des dispositifs peut être portée sur soi par un utilisateur.

12. Système selon l'une quelconque des précédentes revendications, où au moins un dispositif (10) sans capteur (20) et sans interface d'utilisateur (18) est agencé pour émettre des signaux destinés à coopérer avec des dispositifs (10) comportant à la fois un capteur (20) et une interface d'utilisateur (18).

13. Système selon l'une quelconque des revendications précédentes, dans lequel le moyen de communications (16) de certains des dispositifs (10) comprend un réseau cellulaire de communications, permettant à un dispositif (10) de déterminer sa position dans le réseau.

14. Système selon l'une quelconque des revendications précédentes, dans lequel au moins un dispositif (10) est en communication avec une unité de traitement de données centrale.

15. Procédé destiné à être utilisé dans un système d'enregistrement d'informations composé d'au moins deux dispositifs, au moins l'un desdits dispositifs (10) étant alloué à un utilisateur humain et une partie de celui-ci étant portable par ledit utilisateur humain et chaque dispositif comprenant un moyen de communications sans fil (16) avec l'autre dispositif (10), une unité de commande (14) et une base de données (12), l'unité de commande (14) commande l'émission des informations par l'intermédiaire du moyen de communications sans fil (16) concernant l'identification du dispositif respectif (10) et commande en outre la réception des informations d'identification respectives provenant d'autres dispositifs, ledit procédé comprenant les étapes consistant à :

reconnaître la présence d'un autre dispositif (10) en collocation physique ou logique avec le dispositif,
recevoir les informations d'identification depuis l'autre dispositif (10) sur un canal de communications (16), et
mémoriser automatiquement les informations dans les bases de données (12)

16. Procédé selon la revendication 15, ledit procédé comprenant en outre les étapes consistant à :

organiser les données obtenues à partir des informations d'identification reçues sous forme d'un ensemble de cheminements, chaque cheminement comprenant une séquence chronologique de faits horodatés dont la totalité se rapporte à un dispositif unique (10) et dont au moins certains représentent également des descripteurs d'autres dispositifs (10), chaque dispositif (10) représentant une personne ou une entité identifiable, et chacun des faits comprenant un attribut et une valeur de cet attribut pour un dispositif donné (10),
afficher la séquence de faits d'un cheminement sélectionné, ou la séquence des événements définis par la coïncidence de deux ou plusieurs cheminements,
se déplacer en avant ou en arrière dans le temps, sélectivement, au travers de la séquence affichée de faits ou d'événements, et permettre la sélection, pour l'affichage ultérieur, de tout cheminement quelconque parmi les cheminements d'un événement affiché.

Fig. 1

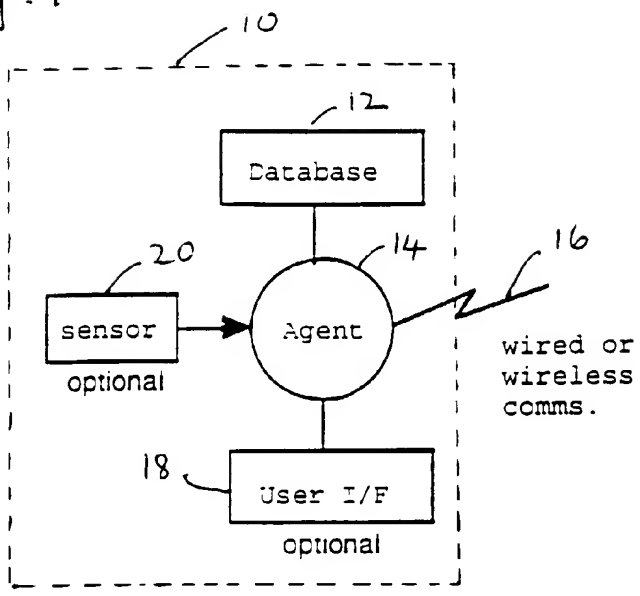
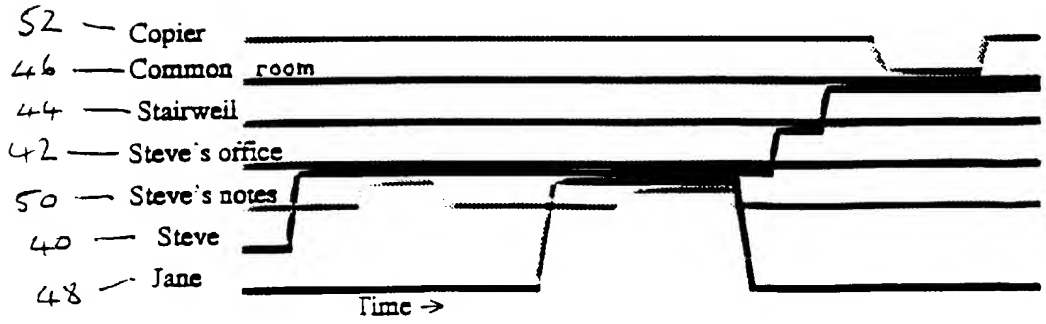

10
12
Database
20
14
16
sensor
Agent
optional
wired or
wireless
comms.
18
User I/F
optional

Fig. 3


52 Copier
46 Common room
44 Stairwell
42 Steve's office
50 Steve's notes
40 Steve
48 Jane
Time →

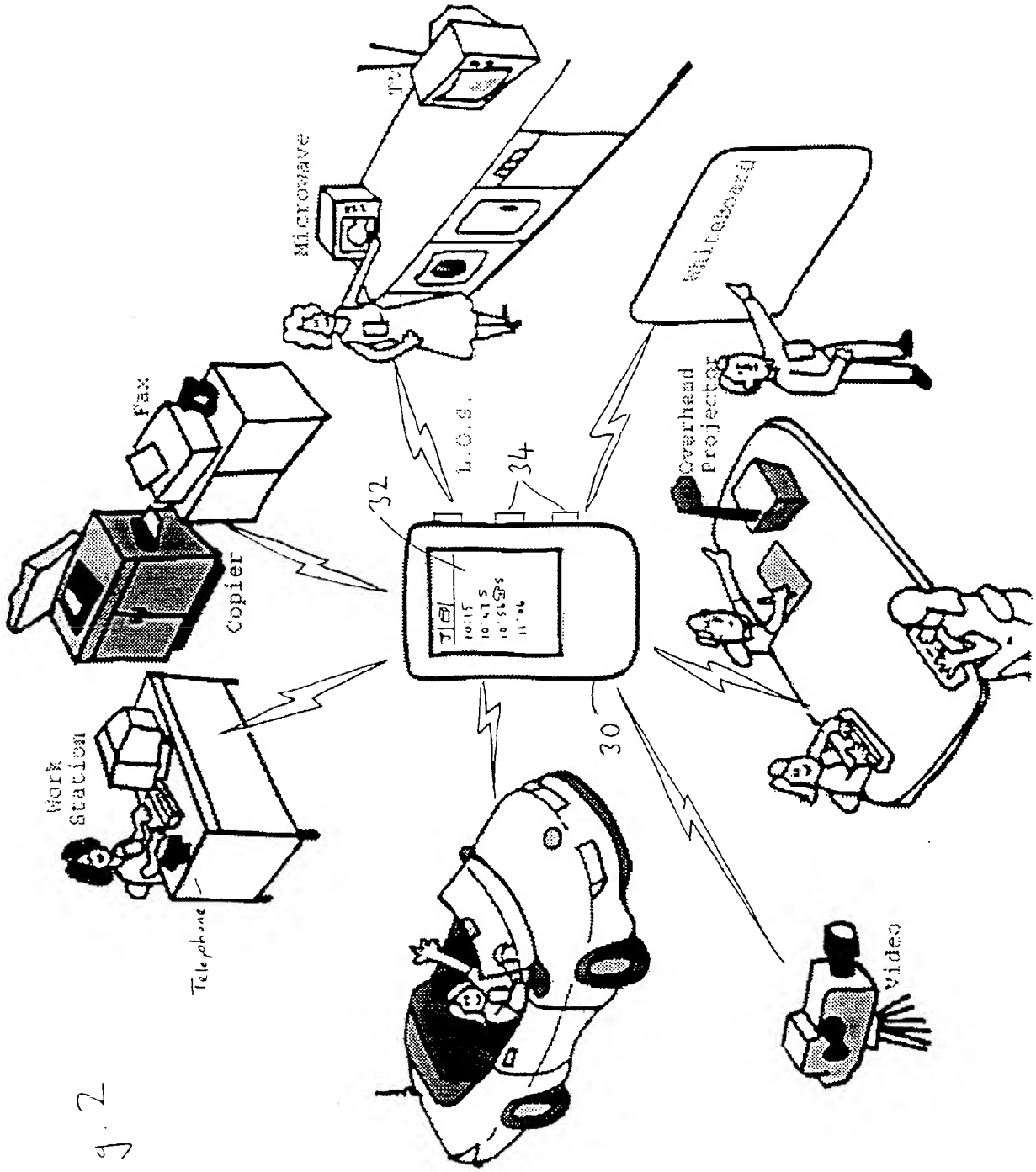

Microwave
Fax
Copier
Work Station
Telephone
L.C.D.
32
34
30
Overhead Projector
Video

Fig. 2

Fig. 4

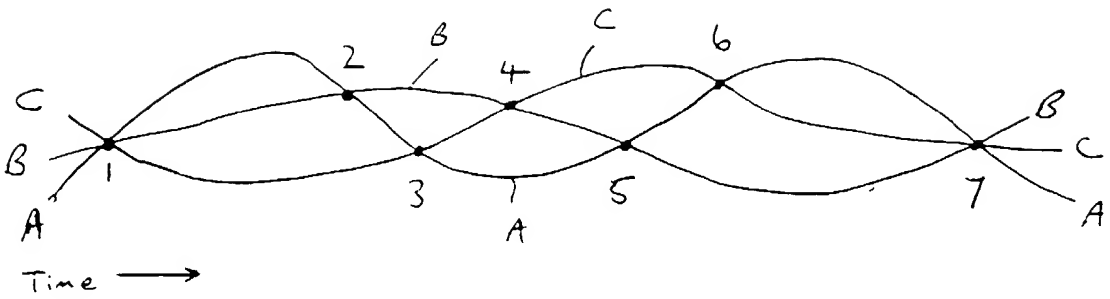

C
B
A
1
2
B
3
4
C
A
5
6
7
B
C
A
Time

Fig. 5

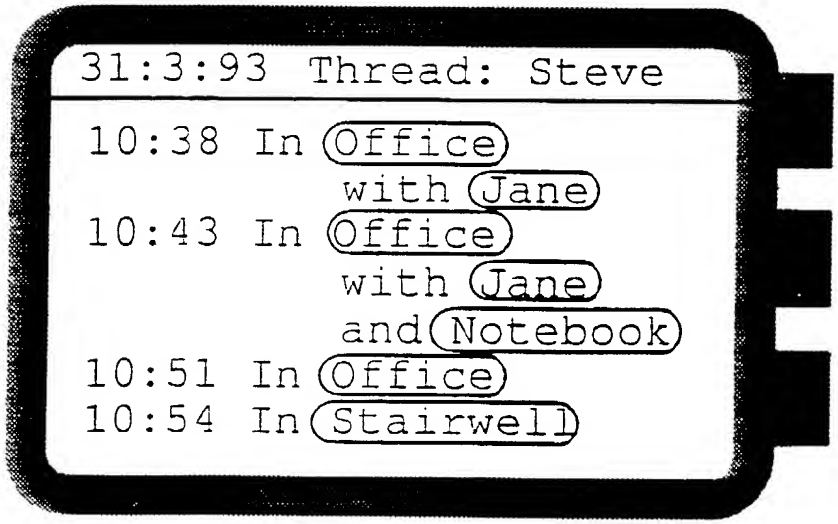
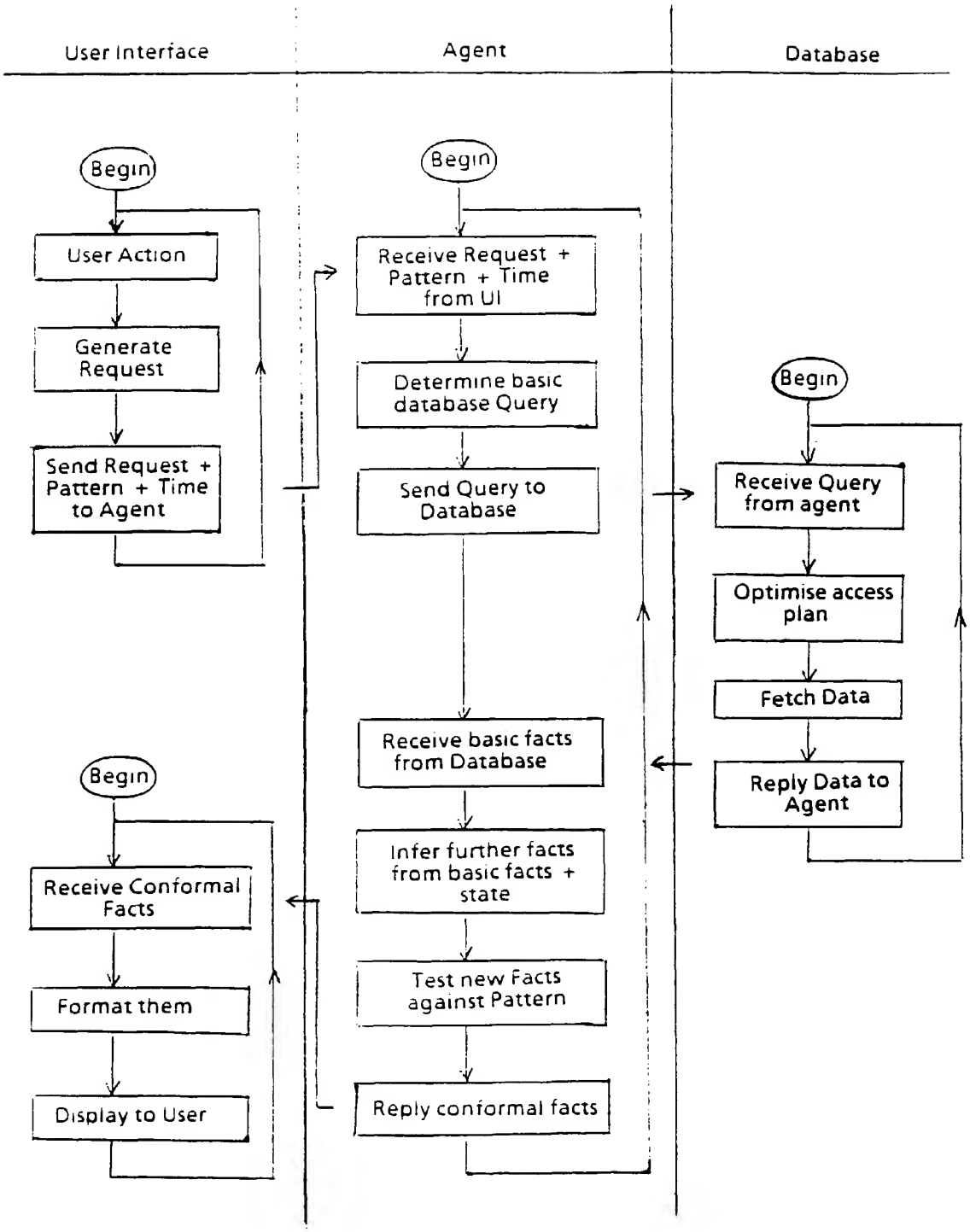

31:3:93 Thread: Steve
10:38 In Office
with Jane
10:43 In Office
with Jane
and Notebook
10:51 In Office
10:54 In Stairwell

Fig. 6


User Interface
Agent
Database
Begin
User Action
Generate Request
Send Request + Pattern + Time to Agent
Begin
Receive Request + Pattern + Time from UI
Determine basic database Query
Send Query to Database
Receive basic facts from Database
Infer further facts from basic facts + state
Test new Facts against Pattern
Reply conformal facts
Begin
Receive Query from agent
Optimise access plan
Fetch Data
Reply Data to Agent
Begin
Receive Conformal Facts
Format them
Display to User